

## CLAIMS

What is claimed:

1. A method of imaging a region of interest with ultrasound energy comprising:

5 providing a portable ultrasound imaging system including a transducer array within a handheld probe, a cable interface that is connected to a data processor housing having a data processing system, a beamforming device and a system controller connected to the beamforming device, the beamforming device including a programmable charge domain delay device;

10 providing output signals from the data processor to the handheld probe to actuate the transducer array;

delivering ultrasound energy to the region of interest;

collecting ultrasound energy returning to the transducer array from

15 the region of interest;

transmitting data from the handheld probe to the processor housing with the cable interface; and

20 performing a beamforming operation with the beamforming device in the processor housing such that the data processing system receives a beamformed electronic representation of the region of interest from the beamforming device.

25 2. The method of Claim 1 wherein the step of providing a beamforming device including a programmable charge domain delay device comprises providing a plurality of charge coupled device delay lines, each delay line being connected to a memory and a system controller.

3. The method of Claim 1 further comprising performing a scan conversion operation with the data processing system.
  4. The method of Claim 1 further comprising performing a down conversion operation on the electronic representation.
  5. The method of Claim 1 further comprising performing a Doppler processing operation on the electronic representation.
- 10           6. The method of Claim 1 further comprising providing a Firewire connection between the data processor and the system controller.
7. The method of Claim 1 further comprising forming a color flow map.
  - 15           8. A portable ultrasound system for imaging a region of interest comprising:
    - a handheld probe in which a transducer array is mounted; and
    - a data processing system within a data processor housing that is connected to the handheld probe with a cable interface such that the data processing system receives a representation of the region of interest, the data processing system including a programmable beamforming charge domain delay device and a system controller connected to the delay device.
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9. The system of Claim 8 wherein the charge domain delay device comprises a plurality of charge coupled device delay lines.
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10. The system of Claim 8 further comprising a scan conversion program on the data processor.

11. The system of Claim 8 further comprising a down conversion processor.
  12. The system of Claim 8 further comprising a Doppler processing program.  
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  13. The system of Claim 8 wherein the transducer array comprises at least 128 transducers.
  14. A method of imaging a region of interest with ultrasound energy comprising:  
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providing a portable ultrasound imaging system including a transducer array within a handheld probe, a cable interface that is connected to a data processor housing having a data processing system, a programmable beamforming device and a system controller connected to the beamforming device, a memory and a data processor in the housing;  
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providing output signals from the data processor to the handheld probe to actuate the transducer array;  
delivering ultrasound energy to the region of interest;  
collecting ultrasound energy returning to the transducer array from the region of interest;  
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transmitting data from the handheld probe to the processor housing with the cable interface;  
performing a beamforming operation with the beamforming device in the processor housing such that the data processing system receives a beamformed electronic representation of the region of interest; and  
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performing a scan conversion operation on the electronic representation with the data processor.

15. The method of Claim 14 further comprising providing a Firewire connection between the data processing system and the beamforming device.
- 5 16. The method of Claim 14 further comprising providing a down conversion processor to convert data to a baseband.
17. The method of Claim 14 further comprising scanning a plurality of subarrays.
- 10 18. The method of Claim 14 further comprising providing a Doppler processor.
19. The method of claim 14 further comprising providing a beamforming device including a plurality of charge coupled device delay lines.
- 15 20. A portable ultrasound system for imaging a region of interest comprising:
  - a handheld probe in which a transducer array is mounted; and
  - a data processing system within a data processor housing that is connected to the handheld probe with a cable interface such that the data processing system receives an electronic representation of the region of interest, the data processing system including a programmable beamforming device and a system controller connected to the beamforming device, a memory and a data processor, the data processor being programmed to perform a scan conversion operation.
- 20 21. The system of Claim 20 further comprising a Firewire connection between the data processing system and the beamforming device.

22. The system of Claim 20 wherein the beamforming device comprises a plurality of charge coupled device delay links.
- 5 23. The system of Claim 20 wherein the transducer array comprises at least 128 transducers.
24. The system of Claim 20 further comprising a display device connected to the data processor.
- 10 25. The system of Claim 20 further comprising a down conversion program.